**Alg. 2 Warm Up #6-2**

# Evaluate the logarithms:

1. $\log_2 8$
2. $\log_2 \frac{1}{4}$
3. $\log_{1/2} \frac{1}{4}$
4. $\log_{1/2} 8$
5. $\log_3 \frac{1}{9}$
6. $\log_3 1$

## HW Questions:

6-119. Use the ideas developed in problem 6-118 to change each of the following quadratic equations into graphing form. Identify the vertex and the line of symmetry for each one.

a. $f(x) = 4x^2 - 12x + 6$ $\longrightarrow$ b. $g(x) = 2x^2 + 14x + 4$

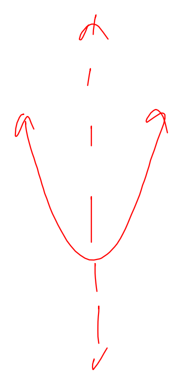
$f(x) = 4(x^2 - 3x + \frac{9}{4}) + 6 - 9$

$\left(-\frac{3}{2}\right)^2$

$f(x) = 4\left(x - \frac{3}{2}\right)^2 - 3$

vertex: $\left(\frac{3}{2}, -3\right)$

axis of sym: $x = \frac{3}{2}$

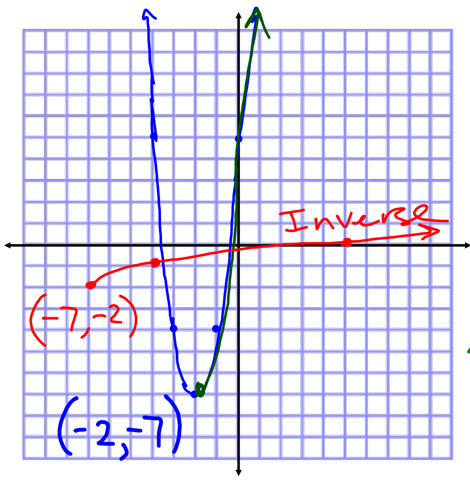


6-120. Consider the function $y = 3(x+2)^2 - 7$ as you complete parts (a) through (c) below.

a. How could you restrict the domain to show "half" of the graph?

b. Find the equation for the inverse function for your "half" graph.

c. What are the domain and range for the inverse function?




a) $x \geq -2$ or $x \leq -2$

b) for $x \geq -2$

$x = 3(y+2)^2 - 7$

$x + 7 = 3(y+2)^2$

$\cancel{\pm}\sqrt{\frac{x+7}{3}} = \sqrt{(y+2)^2}$

$y = \sqrt{\frac{x+7}{3}} - 2$

121. Add or subtract and simplify each of the following expressions. J each step of your process makes sense.

a. $\frac{3}{(x-4)(x+1)} + \frac{6}{x+1}$

b. $\frac{x+2}{x^2-9} - \frac{1}{x+3}$

6-122. Eniki has a sequence of numbers given by the formula $t(n) = 4(5^n)$.

a. What are the first three terms of Eniki's sequence?

b. Chelita thinks the number 312,500 is a term in Eniki's sequence. Is she correct? Justify your answer by either giving the term number or explaining why it is not in the sequence.

c. Elisa thinks the number 94,500 is a term in Eniki's sequence. Is she correct? Explain.

$$\frac{312{,}500}{4} = \frac{4(5)^n}{4}$$

$$78{,}125 = 5^n$$

$$\log(78{,}125) = \log 5^n$$

$$\frac{\log 78{,}125}{\log 5} = \frac{n(\cancel{\log 5})}{\cancel{\log 5}}$$

$n = 7$, so yes, 312,500 is the 7th term in the sequence

Yesterday's CP's

6-109. Use the properties of logs to write each of the following expressions as a sing logarithm, if possible.

a. $\log_{1/2}(4) + \log_{1/2}(2) - \log_{1/2}(5)$

b. $\log_2(M) + \log_3(N)$

c. $\log(k) + x\log(m)$

d. $\frac{1}{2}\log_5 x + 2\log_5(x+1)$

e. $\log(4) - \log(3) + \log(\pi) + 3\log(r)$

f. $\log(6) + 23$

$$\log 4 + \log \pi + \log r^3 - \log 3$$

$$\log\left(\frac{4\pi r^3}{3}\right)$$

6-110. What values must $x$ have so that $\log(x)$ has a negative value? Justify your answer.

Look back at your warm up from today!

6-111. The fact that for any base $m$ (when $m > 0$), $\log_m a + \log_m b = \log_m ab$ is called the **Product Property of Logarithms**. To prove that this property is true, follow the directions below.

a. Since logarithms are the inverses of exponential functions, each of their properties can be derived from a similar property of exponents. Here, you are trying to prove that "logs turn products into sums." First, recall similar properties of exponents. If $a = m^x$ and $b = m^y$, write $a \cdot b$ as a power of $m$.

b. Rewrite $a = m^x$, $b = m^y$, and your answer to part (a) in logarithmic form.

c. In the third equation you wrote for part (b), substitute for $x$ and $y$ to obtain a log equation of base $m$ that involves only the variables $a$ and $b$.

d. The property $\log_m a - \log_m b = \log_m \frac{a}{b}$ is called the **Quotient Property of Logarithms**. Use $a = m^x$ and $b = m^y$ to express $\frac{a}{b}$ as a power of $m$. Then use a similar process to rewrite each into log form and prove the Quotient Property of Logs.

a) Given: $a = m^x$ $\quad b = m^y$

$$ab = m^x \cdot m^y$$

$$\boxed{ab = m^{x+y}}$$

b) $a = m^x$ $\quad b = m^y$ $\quad ab = m^{x+y}$

$\log_m a = x$ $\quad \log_m b = y$ $\quad \boxed{\log_m ab = x+y}$

c) $\boxed{\log_m ab = \log_m a + \log_m b}$

## Review of Log Properties

A Logarithm is an exponent

Definition: $\log_b a = x$ $b^x = a$

exponent

Power Property: $\log_b a^x = x(\log_b a)$

Product Property: $\log_b a + \log_b c = \log_b(ac)$

Quotient Property: $\log_b a - \log_b c = \log_b\left(\frac{a}{c}\right)$

Nothing in front of the word log.

Evaluate the log:

$\log_2 16$

4

$\log_3 \frac{1}{27}$

$-3$

$\log_5 1$

0

$\log_7 7$

1

$\log_p p$

1

$\log_x 1$

0

Solve: (Make the base match if possible!!!)

1. $3^{x+2} = 9^{5x}$

$x = \frac{2}{9}$

2. $4^{x} = \frac{1}{32}$

$(2^2)^x = 2^{-5}$

$2x = -5$

$x = -\frac{5}{2}$

3. $2^{x} = 34$

$x \approx 5.09$

Solve: (Make the base match if possible!!!)

1. $3^{x+2} = 9^{5x}$

$3^{x+2} = (3^2)^{5x}$

$3^{x+2} = 3^{10x}$

$x+2 = 10x$

$\frac{2}{9} = \frac{9x}{9}$

$\boxed{x = \frac{2}{9}}$

2. $4^{x} = \frac{1}{32}$

$(2^2)^x = 2^{-5}$

$2^{2x} = 2^{-5}$

$\frac{2x}{2} = \frac{-5}{2}$

$\boxed{x = -\frac{5}{2}}$

3. $2^{x} = 34$

$\log 2^{x} = \log 34$

$\frac{x(\cancel{\log 2})}{\cancel{\log 2}} = \frac{\log 34}{\log 2}$

$x \approx 5.09$

# HW: 6- #131 ---> 135

Thursday's Quiz:

Graphing a point and
an equation in 3 variables.

Solving a 3 variable system.